Congressional Research Service

Memorandum

May 8, 2006

TO: House Committee on Resources

FROM: Salvatore Lazzari
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Resources, Science, and Industry Division

SUBJECT: Possible Federal Revenues from Oil Development at ANWR and Nearby Areas

This memorandum is in response to your request for an estimate of the potential revenues to the United States Treasury from oil development of the coastal plain study area of the Arctic National Wildlife Refuge (ANWR) should Congress approve such development.[1] In making these estimates it is assumed that: 1) commercial quantities of oil will be found, currently an unknown; 2) current revenue provisions would be applied, e.g., bonus bidding, ad-valorem royalty, and so forth (except that, per your request, we did not assume the 90% Alaska, 10% federal split of current law, but rather a 50-50 split, as found in many current bills); and 3) all of the coastal plain would be available for leasing.[2]

Federal revenues would consist primarily of corporate income taxes on profits earned by oil producers from the production and sale of ANWR oil. As landowner, the federal government would also collect royalties from such production on federal lands, which are included in the estimates. Revenues from bonus bids from federal leases, and rents on undeveloped leases, however, are not included. In addition, the federal government would collect income tax revenues resulting from the secondary feedback effects as a result of the stimulus to general economic activity, but these revenues are not included here. Estimates of technologically recoverable oil used in this memorandum include the resources from the federal lands, as well as Native lands in the Refuge and offshore state lands.

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[1] For background and a discussion of ANWR legislation and surrounding issues, see CRS Issue Brief IB10136, *Arctic National Wildlife Refuge (ANWR): Controversies for the 109th Congress.*

[2] Some recent bills have restricted ANWR development footprints to 2,000 acres, which might not be sufficient to provide access to the entire coastal plain of the Refuge. This analysis assumes production from the whole of the Coastal Plain, Native lands, and nearby state waters.

The revenue projections below are very long-term forecasts of what might happen, and not what will happen, given the methodology and the posited assumptions. All of the data
used in this estimation are provided by the U.S. Energy Information Administration (EIA), as documented in the footnotes. Note that, according to the EIA and the U.S. Geological Survey (USGS), it would take between 7 and 12 years after congressional approval to commence production, if feasible, from ANWR properties. Further, production from the properties is projected to last at least 30 years.

Also, note other uncertainties, in addition to the production starting date and the lands that might be developed: 1) the size of the underlying resource base, 2) the underlying field structure, 3) the costs of development, 4) the market price of oil, 5) the average effective tax rate, and 6) the terms of the authorizing legislation. Thus, revenue projections are highly uncertain. Projections of federal revenue represent totals over the entire recovery period, until oil resources are no longer recoverable. Thus, they do not take into account any increased recovery based on changed economic conditions or the annual flow of production.

Finally, the projections below exclude also potentially large revenues from the development of natural gas, which according to probability analysis may exist in large quantities in the ANWR coastal plain (particularly the 1002 federal area). Revenue projections from natural gas development are excluded because there is currently no way to transport the gas to market (no pipeline or other means of transportation).

Table 1 summarizes the results of our estimation procedure, which is described in the remaining sections of this memorandum. It shows the projected increase in corporate income tax revenues and cumulative estimated royalties projected over the life of the ANWR and other nearby properties — from the production and sale of the estimated technically recoverable reserves of oil.

Table 1 presents sixteen projections (in real, 2006 dollars), each corresponding to an oil price and production scenario. For instance, if producers were able to recover 10.3 billion barrels of oil over the life of the properties — and there is a 50-50 chance that the ANWR coastal plain contains this amount of oil (or more)[3] — and if oil prices are $30/barrel then the federal government is projected to collect nearly $45 billion in revenues over the production period, estimated to be at least 30 years once production commences. This consists of over $30 billion in federal corporate income taxes (**Table 2)**, and a projected $14.3 billion in federal royalties **(Table 3**). (Tables 2 and 3 are each presented below in the sections detailing the estimation procedure for corporate income taxes and royalties.) Note from **Table 1** that if real oil prices remain at their currently high levels of about $75, projected federal revenues from extracting 10.3 billion barrels

[3] U.S. Department of Interior. U.S. Geological Survey. *Economics of U.S. Geological Survey's 1002 Area Regional Assessment: An Economic Update,* Open file Report 2005-1359. U.S. Department of Energy. Energy Information Administration. *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment.* May 2000, SR/O&G/200-02.

in oil reserves— could be as high as $111 billion over the productive life span of the reserves — $76 billion in income taxes and $35 billion in royalties. Note that these estimates assume that all of the oil that is technically recoverable is also economically recoverable, which is not necessarily the case.[4]

The development of ANWR properties would also generate federal revenues in the form of bonus bids from the leases on federal lands, and income tax revenues from secondary feedback and multiplier effects from an expanding economy. Bonus bids have been estimated by the Congressional Budget Office to range from $2 to $10 billion or more, depending on crude oil prices.[5] The additional federal income tax revenues (both individual and business) from the secondary economic effects are more difficult to estimate because they would depend on the annual expenditures generated by from oil development, the geographic dispersion of those expenditures, and the state of the general economy at the time. Neither bonus bids nor income tax revenues from secondary effects are included in **Table 1**.

Table 1. Possible Cumulative Corporate Income Tax Revenue and Royalties from ANWR Oil (billions of 2006 $)

	Estimated Technically Recoverable Oil (billions of barrels)		
	At least 5.7 (prob. = .95)	10.3 (prob.= .5)	16.0 or more (prob. = .05)
Oil Price per Barrel (2006$)	**Revenues (billions of 2006 $)**		
$75	$61.7	$111.5	$173.2
$60	$49.4	$89.3	$138.7
$30	$24.7	$44.7	$69.4
$10	$8.2	$14.9	$23.1

Source: Author's estimates based on EIA data (see text).

Projected Corporate Income Tax Revenues

Increases in federal corporate income taxes would most likely represent the single biggest source of revenue for the federal government if oil were found and produced in ANWR. The basic methodology to estimate potential corporate income taxes is to multiply estimated domestic, pre-tax profits from the assumed oil production at ANWR,

[4] The amount of economically recoverable oil depends on unknown variables such as market oil prices and oil finding costs. With regards to oil prices, the higher the price, the more the amount of economically recoverable reserves approaches the magnitude of technically recoverable reserves.

[5] Memorandum by Douglas Holtz-Eakin to Senator Ted Stevens, December 7, 2005.

projected over the lives of the properties, by the estimated effective federal corporate income tax rate for the major integrated companies that would be expected to have an interest in developing ANWR.

Domestic, pre-tax profits are the difference between revenues (price times output) and production costs. Four hypothetical oil price scenarios are assumed (each in real 2006 dollars), reflecting the unpredictability (and volatility) of world crude prices. Per your request, a high oil price scenario (real crude prices of $60/barrel); a median oil-price scenario (real crude prices at $30/barrel) and a low crude price scenario (real oil prices at $10/barrel). It is important to underscore that these are hypothetical price scenarios and do not constitute projections of what crude oil prices are likely to be. Given current prices, a $75/barrel scenario is also considered.

Oil output is based on a report by the Energy Information Administration, which uses data provided by the U.S. Geological Survey.[6] This report estimates projected oil (and gas) output for the three areas of the geographic coastal plain (including areas outside the ANWR boundary) expected to be developed should congressional approval be forthcoming. Within the Refuge these are: 1) the section 1002 area of federal lands;[7] and 2) 92,000 acres belonging to Native Alaskan peoples.[8] In addition, prospects for development of Alaskan state lands (offshore lands outside the Refuge out to the 3-mile limit) are likely to be improved by onshore development and were included in this analysis. Under §1003 of the Alaska National Interest Lands Conservation Act (P.L. 96-487), all lands inside ANWR are closed to development unless Congress changes the law. Were oil and gas development authorized for the federal lands in the Refuge, development would also be allowed or become feasible on the nearly 100,000 acres of Native lands in the refuge,[9] possibly free of any acreage limitation applying to development on the federal lands, depending on how legislation is framed.

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[6] Energy Information Administration. *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment.* May 2000, SR/O&G/200-02; U.S. Geological Survey. *The Oil and Gas Resource Potential of the Arctic National Wildlife Refuge 1002 Area, Alaska.* Survey Open File Report 98-34, 1999, Chapter EA (Economic Analysis).

[7] This area of federal lands is referred to as the "section 1002 area" because of a study required in §1002 of Alaska National Interest Lands Conservation Act (ANILCA, P.L. 96-487) of 1980. The current prohibition on oil and gas development in ANWR is in §1003 of ANILCA.

[8] The 92,000 acres belong to the Kaktovik Inupiat Corporation and the Arctic Slope Regional Corporation. In addition, several thousand acres are held in individual native allotments. The May 2000 EIA report considered only the 92,000 acres. See *Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment.* May 2000, SR/O&G/200-02, op. cit., p. vii.

[9] The Native lands inside ANWR fall into three categories: approximately three townships of Native lands within the *geographic* coastal plain of the Refuge but outside the administratively defined 1002 area; one township of Native land also within the *geographic* coastal plain of the Refuge, but administratively part of the 1002 area; and a number of Native allotments scattered through the *geographic* coastal plain, with some concentrations along the coast and in the foothills. Offshore state lands are largely open to development, although the state and the federal governments have disputed precise boundaries. For legal background, see CRS Report RL31115, *Legal Issues Related to Proposed Drilling for Oil and Gas in the Arctic National Wildlife Refuge (ANWR),* by Pamela Baldwin.

According to the USGS assessment of possible oil in the three areas described above, there is a 95% probability there are 5.7 billion barrels or more of technically recoverable crude oil and natural gas liquids in the three areas described above, and a 5% probability that are 16.0 billion barrels or more. USGS's mean estimate — 50% probability — is 10.3 billion barrels. About three fourths of the possible oil and natural gas liquids[10] are estimated to be under federal lands, and one fourth under Native Corporation lands and the adjacent offshore state lands.[11]

For each recoverable oil quantity and price combination scenario, federal corporate income tax revenue was arrived at by (1) multiplying the quantity times the price, (2) subtracting production costs (operating costs plus depreciation, depletion, amortization, and administration), and (3) multiplying the result by the average effective federal corporate tax rate on major U.S. energy producers.

Projections of production costs were based upon annual financial data on oil and gas industry operations published by the EIA in its *Performance Profiles* reports covering the major U.S.-based energy producing companies.[12] A ten-year average (for 1995-2004) was used to remove the volatility of profits over business cycles and fluctuations in volatile market oil prices to accurately reflect the long-term nature of oil development in the ANWR coastal plain, which, if successful, would be expected to produce oil for at least 30 years. Based upon the *Performance Profiles* data, production costs of domestic oil and gas producers averaged 69.3% of revenues over the 1995-2004 period and, consequently, net pre-tax profits for those companies averaged 30.7% of revenue.[13] That percentage was used to project net pre-tax profits from ANWR output over the life of the wells. The production cost percentage was based upon cost data for all domestic U.S. operations rather than just for Alaska, which are not available. Also, the costs reflect the consolidated operations of largely major integrated producers, rather than just production operations.

The effective federal corporate income tax rate also was estimated using EIA's *Performance Profiles*. Based upon data in those reports, the average effective tax rate for the years 1998-2004 was 32%. This was derived by subtracting from the U.S. federal tax any foreign tax credit (which would not be claimed on income from ANWR operations), and dividing by U.S. pre-tax income.[14] This effective tax rate probably is an upper bound; and the actual effective tax rate over the production horizon might end up being lower due to substantial industry investments in ANWR oil and gas development. Also, the estimation of the effective tax rate assumes that current legislation remains unchanged. Any future amendments to current tax laws could, of course, have the effect of either lowering or raising effective tax rates.

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[10] For production calculations, natural gas liquids are considered to be equivalent to oil.

[11] U.S. Geological Survey. *Frontier Areas and Resource Assessment: the Case of the 1002 Area of the Alaska North Slope*. USGS Open File Report 02-119. Hereafter referred to as "*Frontier Areas.*"

[12] Energy Information Administration. *Performance Profiles of Major Energy Producers (Issues 2004, 2002, 2000, 1998, and 1996)*. Data used are in the table that reports Income Components and Financial Ratios in Oil and Natural Gas Production for FRS Companies.

[13] Ibid.

[14] The effective tax rates were based upon both non-vertically integrated companies and vertically integrated companies. The EIA data are not disaggregated.

Table 2. Possible Corporate Income Tax Revenues from Successful ANWR Oil Development (billions of 2006 $)

	Estimated Technically Recoverable Oil Output (billions of barrels)		
	At least 5.7 (prob. = .95)	10.3 (prob. = .5)	16.0 or more (prob. = .05)
Oil Price per Barrel (2006$)	**Revenues (billions of 2006 $)**		
$75	$42.0	$75.9	$117.9
$60	$33.6	$60.7	$94.3
$30	$16.8	$30.4	$47.2
$10	$5.6	$10.1	$15.7

Source: Author's estimates based on EIA data (see text).

Federal Royalties

Landowners typically collect royalties on minerals extracted from their lands by mineral operators and producers. Likewise the federal government earns royalties from production of oil and gas on federal lands. The federal lands in ANWR have been estimated by the U.S. Geological Survey to contain 74% of the total estimated technically recoverable reserves in ANWR. (The remaining 26% of total recoverable oil resides in state and Alaska Native Corporation lands.)[15]

Current federal laws effectively allocate 90% of the royalties from oil and gas production on federal lands to the states; the federal government retains the remaining 10%.[16] However, in our revenue projections you have asked us to assume a 50-50 split of all royalties, although this is not settled.[17] **Table 3** shows the projected total royalties collected over the expected productive lifetime of the federal ANWR properties.

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[15] *Frontier Areas*, op. cit..

[16] However, the manner is which royalties are split between states and the federal government differs. For all states except Alaska, direct royalties under the Mineral Leasing Act (MLA) are divided equally (50-50) between the state in which the deposits are located and the federal government. The MLA also provides that all states except Alaska get back 40% from the Reclamation Fund (established by the Reclamation Act of 1902), in effect giving each state 90% of the royalties and the federal government 10%. Alaska does not receive allocations from the Reclamation Fund, so to equalize royalty treatment among the states, the Alaska Statehood Act and the Federal Land Policy and Management Act provide that Alaska's royalty share is 90% of the direct royalties (rather than 50%).

[17] Many but not all bills that would approve development of ANWR provide for a 50-50 division of the royalties. Some bills (e.g., H.R. 39 in the 109th Congress) have been silent on revenue distribution, and it is not certain how courts would rule on certain revenue provisions. For more

Table 3. Projected Federal Royalties from Possible ANWR Oil (billions of 2006 $)

	Estimated Technically Recoverable Oil from Federal Lands (billions of barrels)		
	At least 4.2 (prob. = .95)	7.6 (prob. = .5)	11.8 or more (prob. = .05)
Oil Price per Barrel (2006$)	**Revenues (billions of 2006 $)**		
$75	$19.7	$35.6	$55.3
$60	$15.8	$28.6	$44.4
$30	$7.9	$14.3	$22.2
$10	$2.6	$4.8	$7.4

Source: Author's estimates based on EIA data (see text).

information see: U.S. Library of Congress. Congressional Research Service. *Arctic National Wildlife Refuge (ANWR): Controversies for the 109th Congress.* Issue Brief IB10136, (regularly updated).